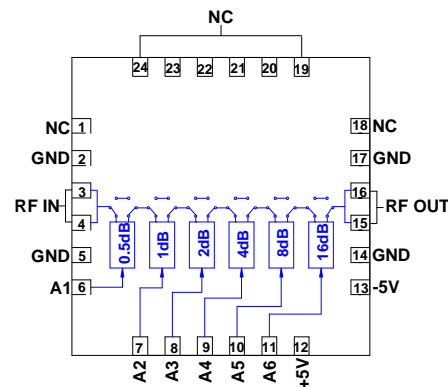


## 4.0 – 7.0 GHz 6-Bit Digital Attenuator

### Features

- ◆ Frequency Range : 4.0 to 7.0 GHz
- ◆ 31.5dB Attenuation Range
- ◆ 4.5dB Insertion loss max.
- ◆  $\pm 0.5$ dB Attenuation Error
- ◆ Low Insertion Phase variation
- ◆ 50 $\Omega$  Impedance
- ◆ 0.35dB RMS Error
- ◆ Integral TTL driver
- ◆ 24 Lead 6 x 6 x 1.2 mm QFN Package

**Functional Diagram**


### Typical Applications

- ◆ Radar
- ◆ Military & Space
- ◆ Instrumentation
- ◆ Test and Measurements
- ◆ Instrumentation Applications

### Description

The AMT2361011OP is a high performance 6-bit digital attenuator mounted in a 24-lead 6x6mm open-pak QFN package. Covering 4 to 7GHz, the insertion loss is less than 4.5dB. The attenuator bit values are 0.5dB (LSB), 1,2,4,8 and 16dB (MSB) for a total attenuation of 31.5dB. The attenuator features good attenuation accuracy of  $\pm 0.5$ dB over all 64 states with an IIP3 of 35dBm. The attenuator provides an integral TTL driver facilitating a 6-bit control. The driver operates on +5/-5V voltages with minimal DC power consumption.

### Absolute Maximum Ratings <sup>(1)</sup>

Parameter	Absolute Maximum	Units
RF Input Power	30	dBm
Positive Supply Voltage	+6	V
Negative Supply Voltage	-6	V
Control Voltage ON OFF	+5.5 -0.5	V
Operating Temperature	-40 to +85	$^{\circ}$ C
Storage Temperature	-65 to +150	$^{\circ}$ C

1. Operation beyond these limits may cause permanent damage to the component

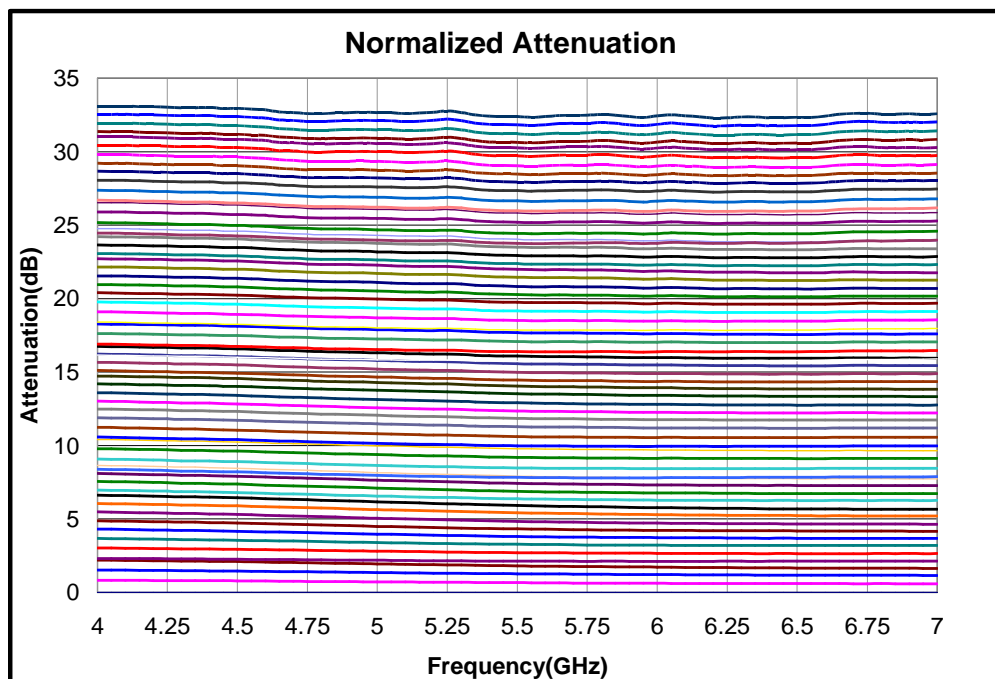
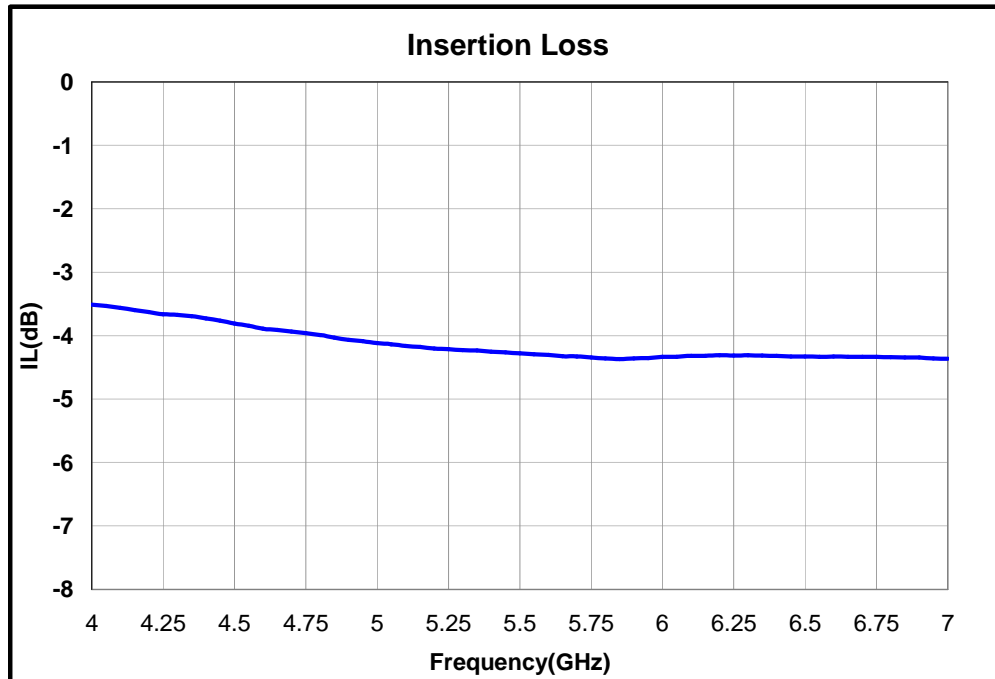
**Electrical Specifications <sup>(1)</sup> @ T<sub>A</sub> = 25 °C, Z<sub>o</sub> =50 Ω**

Parameter	Min.	Typ.	Max.	Units
Frequency	4.0	-	7.0	GHz
Insertion Loss	-	4.3	4.5	dB
Attenuation Range	0	-	31.5	dB
Attenuation step	-	0.5	-	dB
Attenuation Accuracy (All States)	± (0.4+4% of Attn Setting)			dB
Phase variation over all Attenuation states	-	10	-	deg
RMS Error (Calibrated)	-	0.3	-	dB
Input Return Loss	10	12	-	dB
Output Return Loss	15	17	-	
Input Power for 1dB Compression	-	25	-	dBm
Input IP3 Two-Tone Input Power = 0dBm Each Tone	-	35	-	
Switching Speed*	-	<50	-	nS
DC Bias Voltages	-	+5, -5	-	V
Control Voltage	-	0 / +5	-	V

\*Refer Application Note AN\_SW-SP for Switching Speed information.

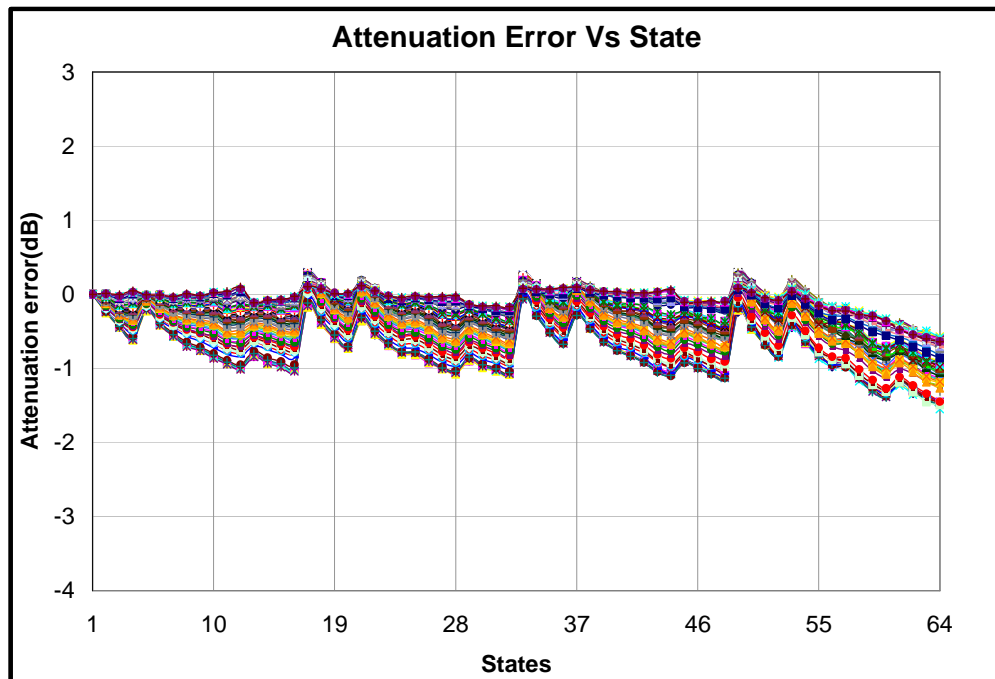
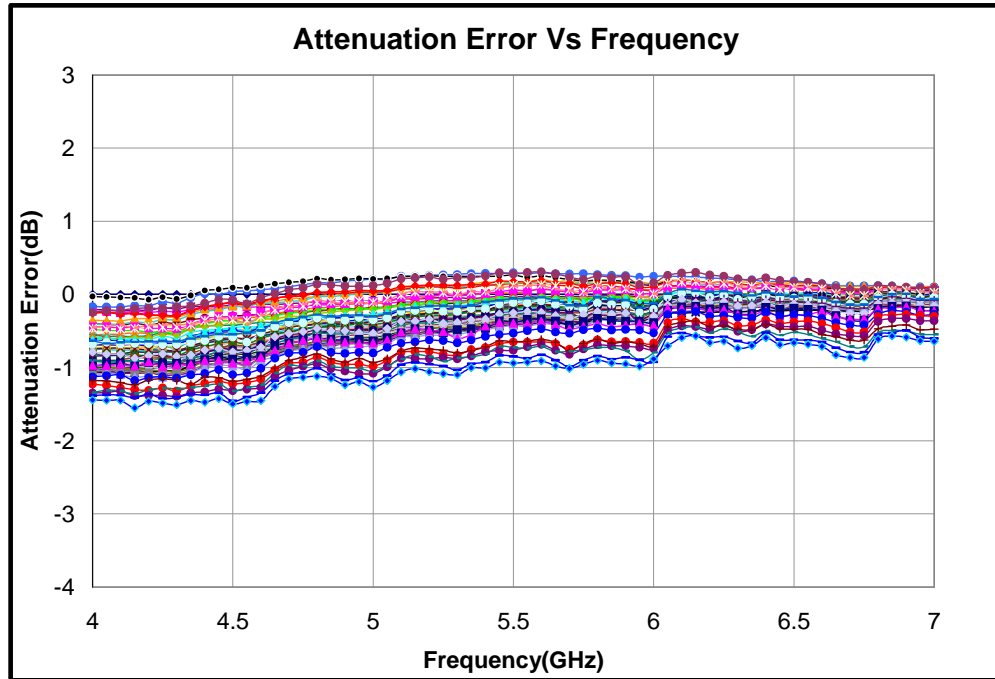
**Note:**

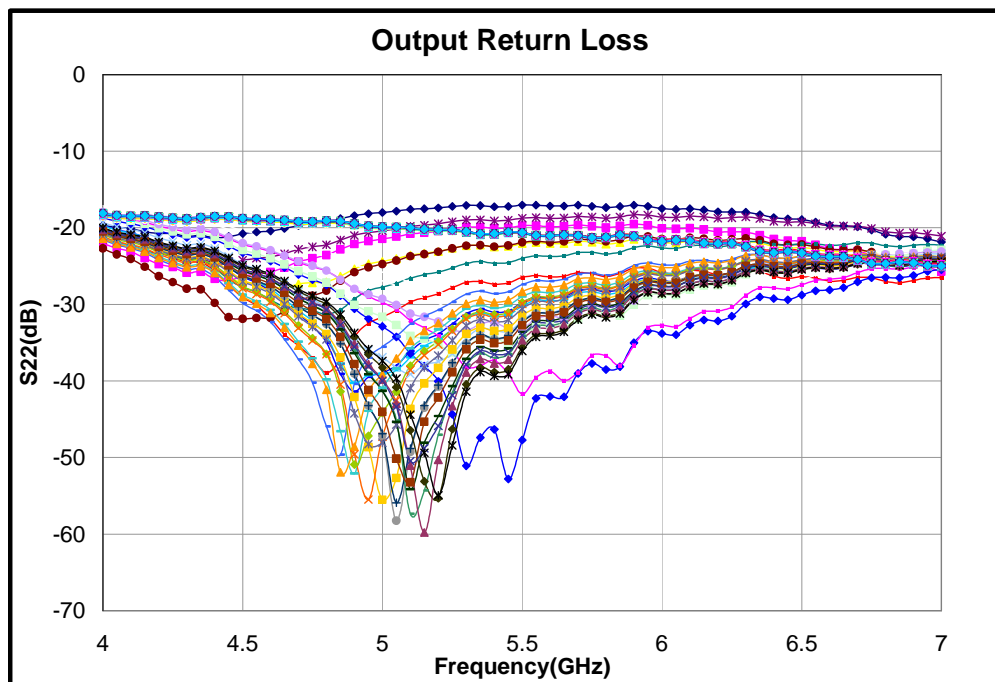
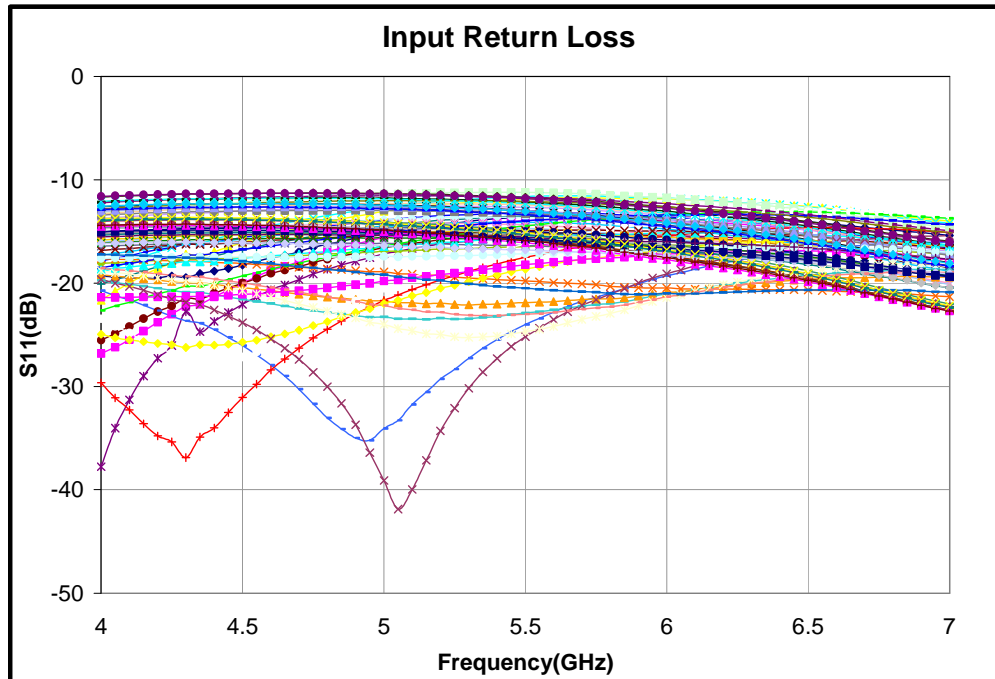
1. The above mentioned electrical specifications are measured in 50Ω PCB mounted QFN package.
2. The RF input & output ports are DC coupled.
3. For accurate operation external DC blocking capacitors are required at the RF input & output ports.

**Test Fixture data** $T_A = 25^\circ\text{C}$ 

Test Fixture data

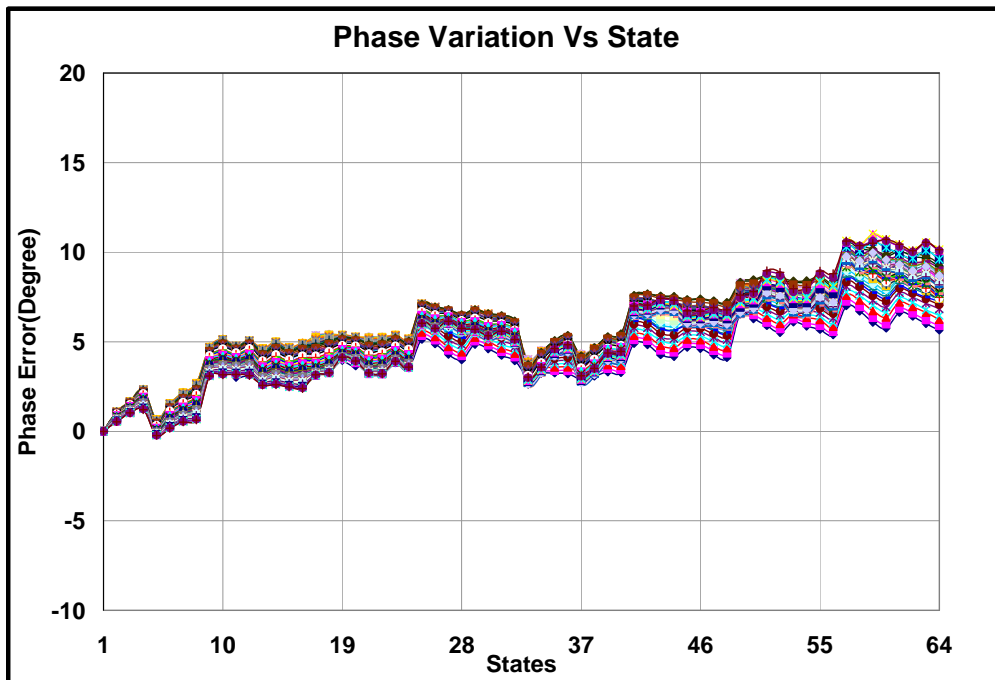
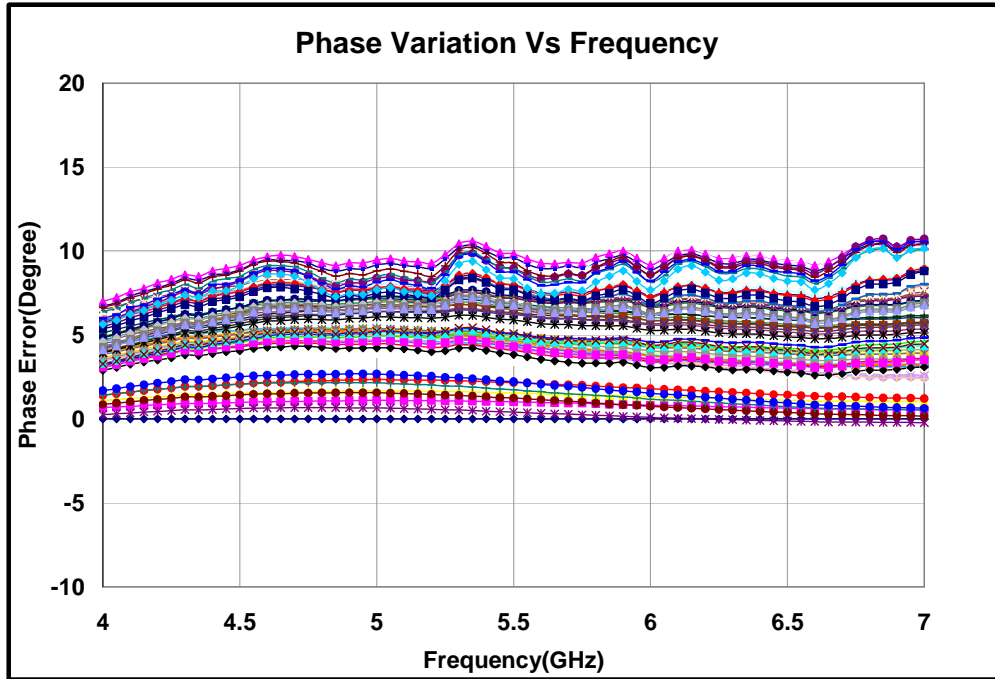
$T_A = 25^\circ C$

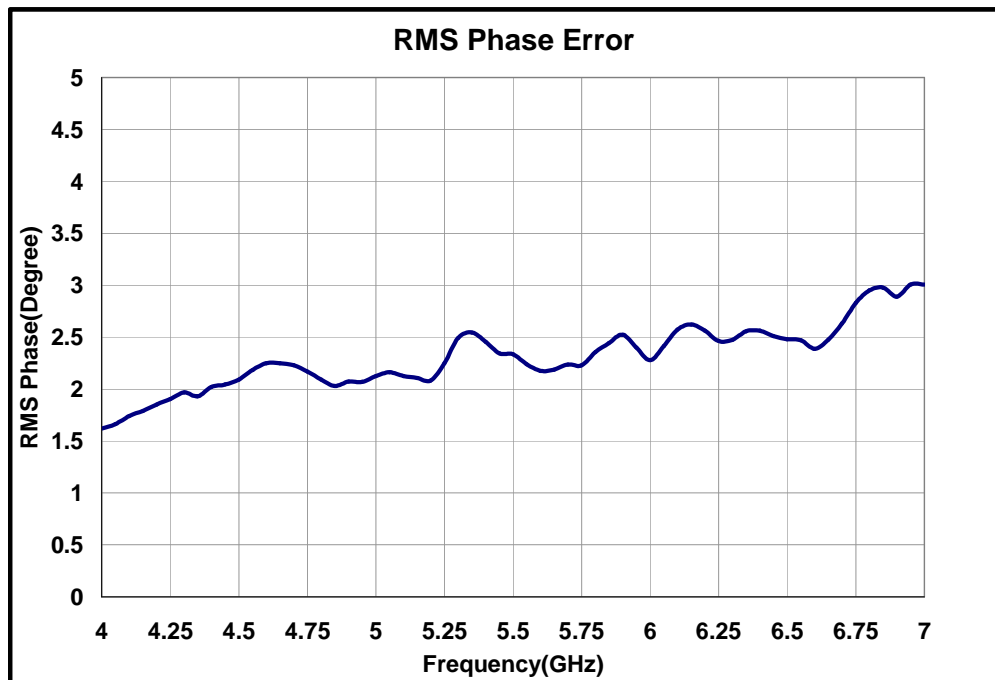
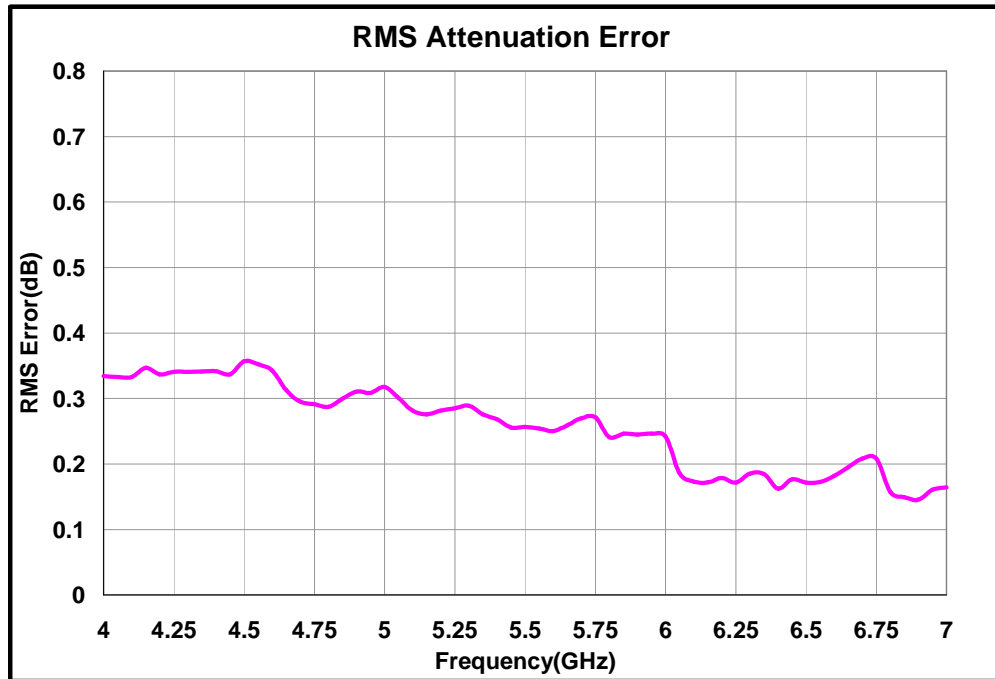


**Test Fixture data** $T_A = 25^\circ\text{C}$ 

**Test Fixture data**

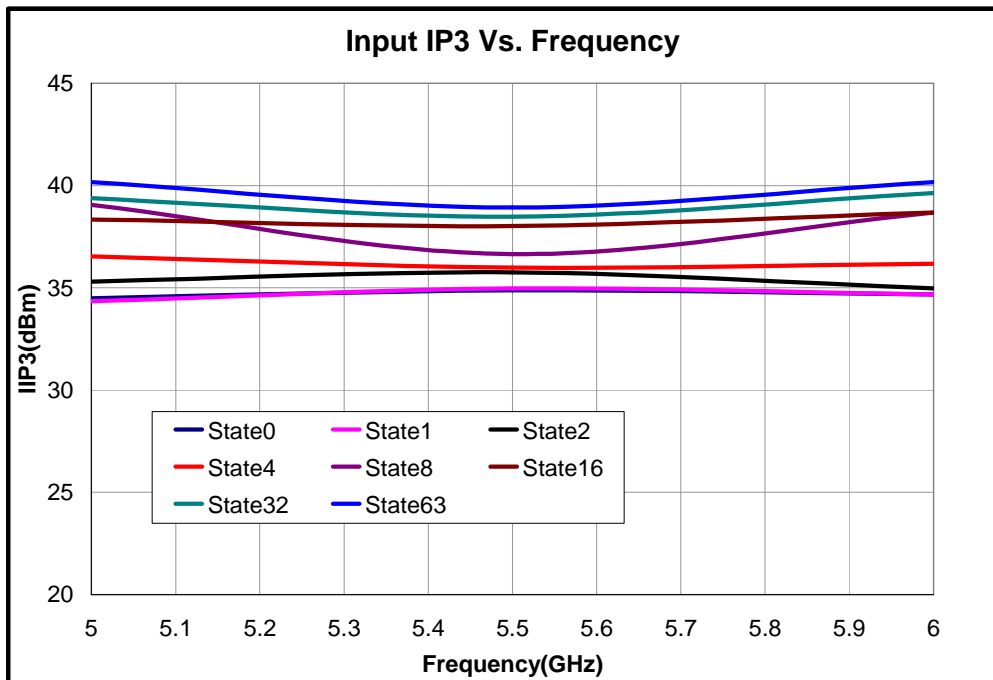
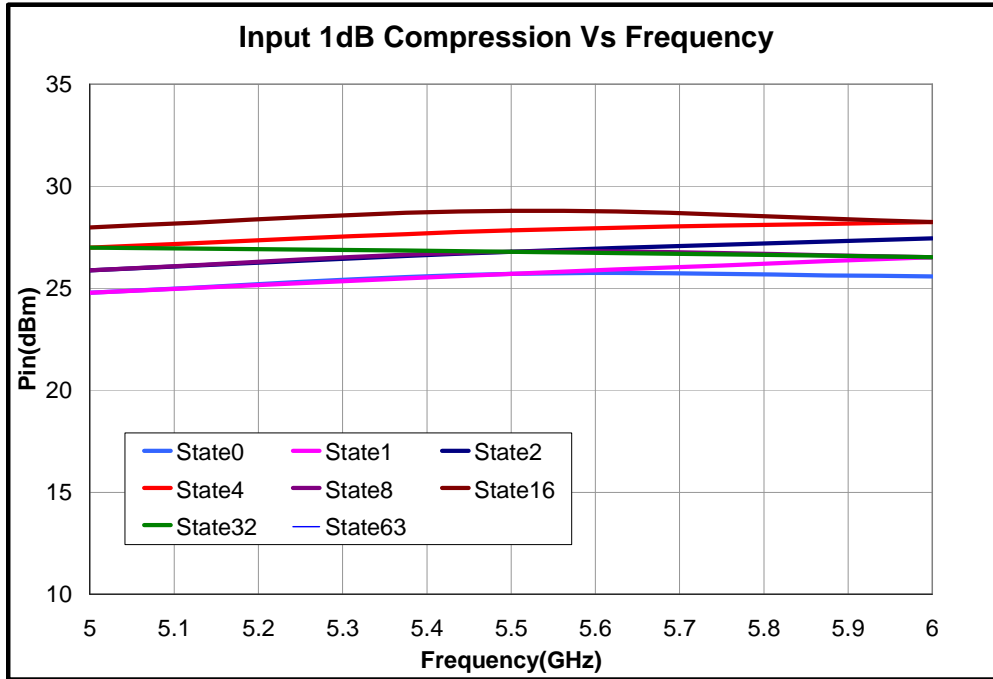
$T_A = 25^\circ\text{C}$



**Test Fixture data** $T_A = 25^\circ\text{C}$ 

**Test Fixture data**

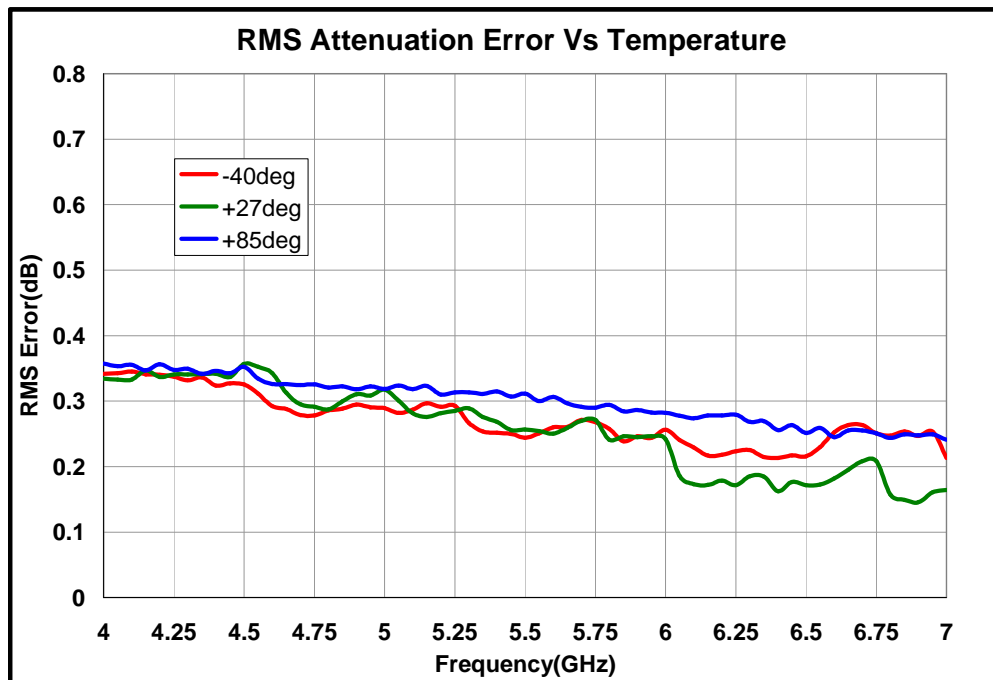
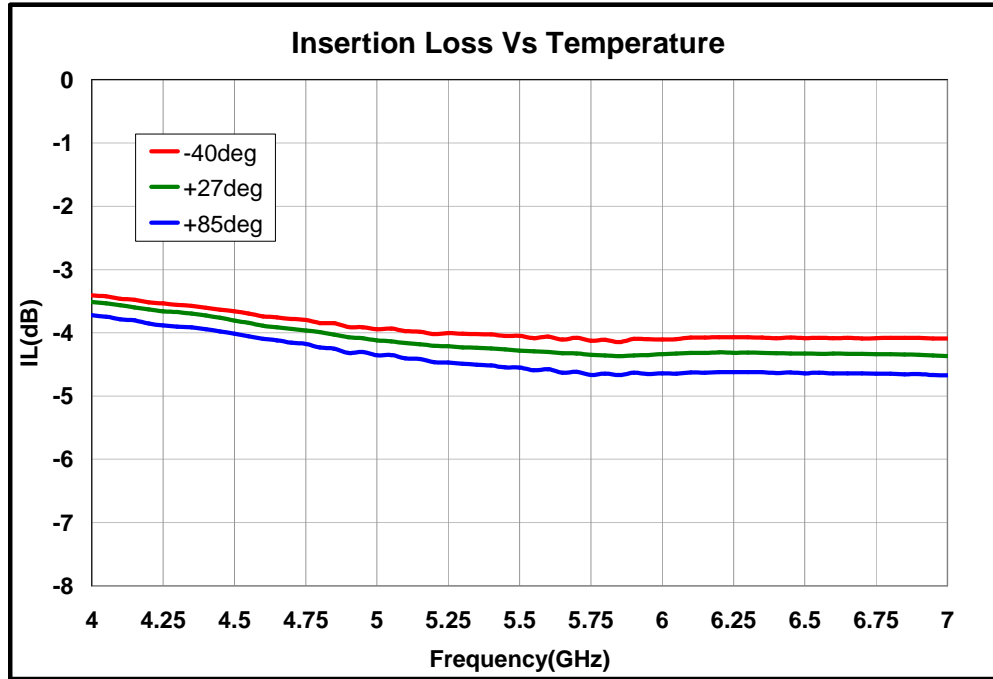
$T_A = 25^\circ C$



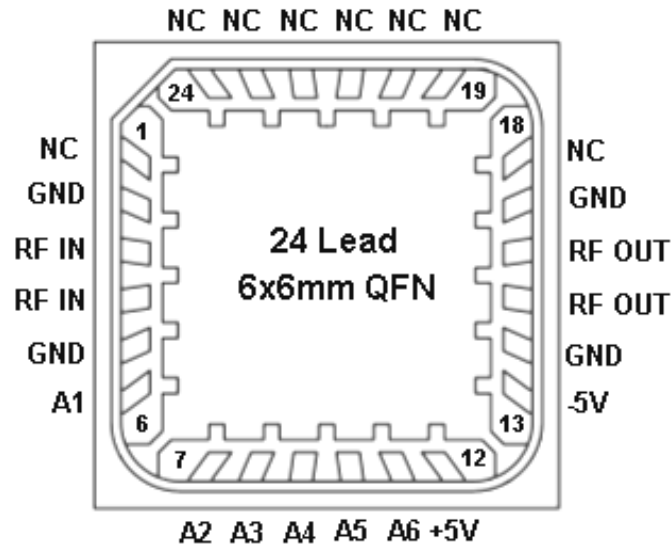


**Test Fixture data**

$T_A = 25^\circ C$



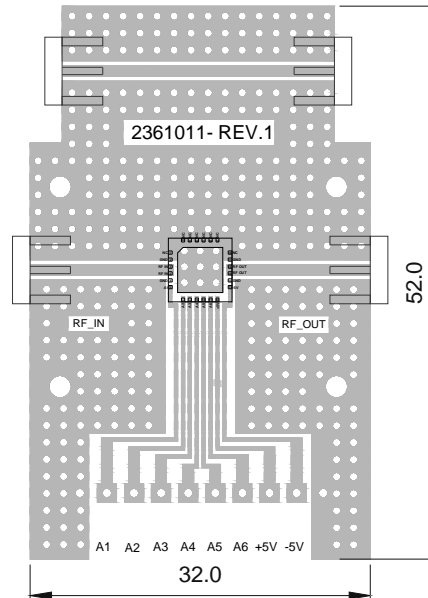
### Pin Configuration (Top View)



### Pin Descriptions

PIN	Function	Description
1	NC	No Connection
2	GND	Ground
3,4	RF IN	RF Input
5	GND	Ground
6	A1(LSB)	DC Control Voltage
7	A2	DC Control Voltage
8	A3	DC Control Voltage
9	A4	DC Control Voltage
10	A5	DC Control Voltage
11	A6(MSB)	DC Control Voltage
12	+5V	DC Supply Voltage
13	-5V	DC Supply Voltage
14	GND	Ground
15,16	RF OUT	RF Output
17	GND	Ground
18 - 24	NC	No Connection

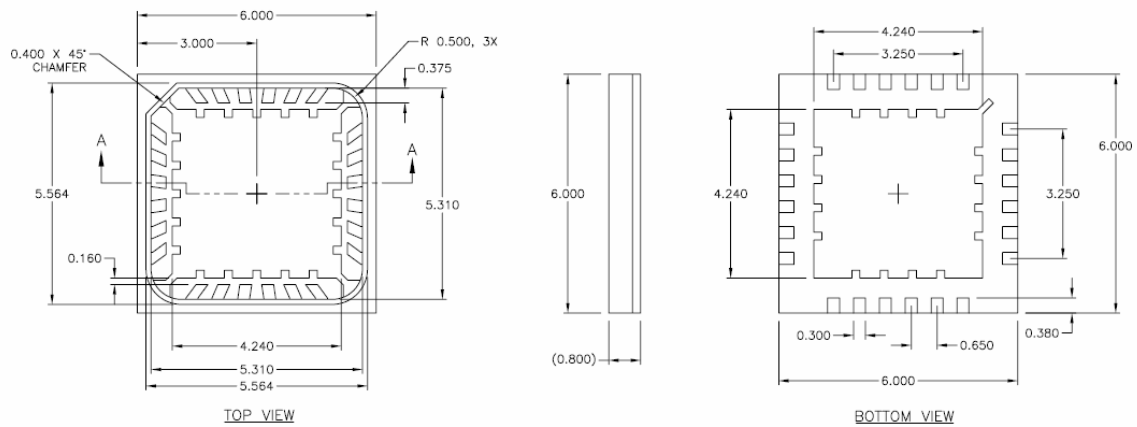
## Test Board Pattern



**Note:**

1. Circuit board material: Rogers 4350
2. Input\Output signal lines have 50Ω impedance
3. No off chip component is required.

## Package Outline Drawing



**Note:**

All dimensions are in Millimeters.

**Truth Table**

State	Attenuation (dB)	TTL Control ( 1 = 3.3 to 5 V, 0 = 0 to 0.5 V )					
		A6 (16)	A5 (8)	A4(4)	A3 (2)	A2(1)	A1 (0.5)
0	0	0	0	0	0	0	0
1	0.5	0	0	0	0	0	1
2	1	0	0	0	0	1	0
3	1.5	0	0	0	0	1	1
4	2	0	0	0	1	0	0
5	2.5	0	0	0	1	0	1
6	3	0	0	0	1	1	0
7	3.5	0	0	0	1	1	1
8	4	0	0	1	0	0	0
9	4.5	0	0	1	0	0	1
10	5	0	0	1	0	1	0
11	5.5	0	0	1	0	1	1
12	6	0	0	1	1	0	0
13	6.5	0	0	1	1	0	1
14	7	0	0	1	1	1	0
15	7.5	0	0	1	1	1	1
16	8	0	1	0	0	0	0
17	8.5	0	1	0	0	0	1
18	9	0	1	0	0	1	0
19	9.5	0	1	0	0	1	1
20	10	0	1	0	1	0	0
21	10.5	0	1	0	1	0	1
22	11	0	1	0	1	1	0
23	11.5	0	1	0	1	1	1
24	12	0	1	1	0	0	0
25	12.5	0	1	1	0	0	1
26	13	0	1	1	0	1	0
27	13.5	0	1	1	0	1	1
28	14	0	1	1	1	0	0
29	14.5	0	1	1	1	0	1
30	15	0	1	1	1	1	0
31	15.5	0	1	1	1	1	1
32	16	1	0	0	0	0	0
33	16.5	1	0	0	0	0	1
34	17	1	0	0	0	1	0
35	17.5	1	0	0	0	1	1

**Truth Table**

State	Attenuation (dB)	TTL Control ( 1 = 3.3 to 5 V, 0 = 0 to 0.5V )					
		A6 (16)	A5 (8)	A4(4)	A3 (2)	A2(1)	A1 (0.5)
36	18.0	1	0	0	1	0	0
37	18.5	1	0	0	1	0	1
38	19	1	0	0	1	1	0
39	19.5	1	0	0	1	1	1
40	20	1	0	1	0	0	0
41	20.5	1	0	1	0	0	1
42	21	1	0	1	0	1	0
43	21.5	1	0	1	0	1	1
44	22	1	0	1	1	0	0
45	22.5	1	0	1	1	0	1
46	23	1	0	1	1	1	0
47	23.5	1	0	1	1	1	1
48	24	1	1	0	0	0	0
49	24.5	1	1	0	0	0	1
50	25	1	1	0	0	1	0
51	25.5	1	1	0	0	1	1
52	26	1	1	0	1	0	0
53	26.5	1	1	0	1	0	1
54	27	1	1	0	1	1	0
55	27.5	1	1	0	1	1	1
56	28	1	1	1	0	0	0
57	28.5	1	1	1	0	0	1
58	29	1	1	1	0	1	0
59	29.5	1	1	1	0	1	1
60	30	1	1	1	1	0	0
61	30.5	1	1	1	1	0	1
62	31	1	1	1	1	1	0
63	31.5	1	1	1	1	1	1



***GaAs MMIC devices are susceptible to Electrostatic discharge. Proper precautions should be observed during handling, assembly & testing***

All information and Specifications are subject to change without prior notice